1. In this problem we use the Euler-Maclaurin summation formula to approximate a sum by an integral.

(a) Recall that the future value after $t$ years of a deposit $P$, made today into an account earning continuously-compounded interest at annual rate $r$, is $Pe^{rt}$. Write a sum that expresses the future value after five years of biweekly paychecks, each in the amount $2000$, deposited into an account with interest compounded continuously at rate $r = 1.5\%$ per year. (Look up income stream in the integration applications chapter of your calculus textbook if you get stuck.)

(b) The exact value of the sum from part (a) can be found easily using a spreadsheet or a programmable calculator. If you only had pencil and paper, you could approximate the sum by an integral. Write the integral (for $t$ between 0 and 5) whose Riemann sum might resemble your answer to part (a).

(c) Rearrange the Euler-Maclaurin summation formula so that the sum of function values at equally-spaced inputs is on one side of the equation. The other side should have an integral of the function and a correction term involving the Bernoulli numbers and higher-order derivatives.

(d) Apply the result of part (c) to write the difference between the sum in part (a) and the integral in part (b) as a series in powers of $h$, where $h = \frac{5-0}{N}$ and $N$ is the number of biweekly pay periods in five years.

(e) Evaluate the correction term to order $h^2$.

(f) Evaluate the correction term to order $h^4$.

2. p. 220, Problem 7.3

3. p. 220, Problem 7.4

4. Evaluate Simpson’s rule on $[-1, 1]$ (one subinterval, not a composite formula) for each of the monomial integrands $1$, $x$, $x^2$, . . . , $x^6$. For which of the integrands is the error nonzero? Does the result of this problem contradict Professor Talman’s claim in the paper http://clem.mscd.edu/~talmanl/PDFs/Misc/Quintics.pdf? Explain your reasoning in complete sentences.

5. p. 248, Problem 8.4

6. p. 273, Problem 9.2